METEOROLOGICAL SATELLITE (METSAT)

SMALL TACTICAL TERMINAL (STT)

CONCEPT OF OPERATIONS

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1. INTRODUCTION.

a. The METSAT STT will provide mission planners and aircrews with real time images/products of weather conditions in target areas. Air Force weather personnel will operate the METSAT STT to support Army and Air Force combat operations. The STT must provide multiservice combat forces with a a-person portable satellite data receipt and analysis capability. It (STT) will receive data directly from the satellite without reliance on other means of communications. The data streams will consist of visual and infrared imagery and mission sensor data. The STT must process and store this data, generate meteorological soft and hard copy display products, and forward the imagery and data to other systems.

b. The STT will have two configurations, the Basic STT (B STT) and Enhanced STT (E STT). The B STT, a first-in system for most weather teams (WETMs), will automatically receive the Defense Meteorological Satellite Program (DMSP) Real-Time Data Smooth (RDS) data stream with 1.5 nautical mile (NM) resolution. The E STT will automatically receive the DMSP Real-Time Data (RTD) with 0.3 NM resolution. The STT system also must receive and display polar orbiting Automatic Picture Transmission (APT) imagery, High Resolution Picture Transmission imagery, and Weather Facsimile (WEFAX) data and imagery transmitted by geostationary satellites.

2. MISSION STATEMENT. During wartime and contingency support, the STT will provide real-time regional satellite data and imagery and other specialized meteorological, terrestrial, and oceanographic data to deployed Air Force and Army units. In peacetime, the STT will provide imagery and data to enhance resource protection and flight safety during training and exercise support.

3. SYSTEM DESCRIPTION.

a. The STT must receive, display, and store data from Department Of Defense (DOD) and civil polar orbiting and geostatfonary weather satellites. The STT system must include satellite data receiving equipment that allows autonomous satellite ingest and processing, a modem, high resolution display and hard copy equipment, and a generator. (For Army applications, the STT will be integrated into the Integrated Meteorological System (IMETS)). Antenna size will depend on the system being supported. The B STT will require a small, lightweight, easily assembled DMSP antenna (2 feet); whereas, the DMSP antenna for the E STT will be larger to accommodate receipt of finer resolution data (8 to 10 feet). Both the B STT and E STT will use a lightweight omni-directional antenna for receipt of imagery from other polar orbiting satellites. The STT system must include computer resources for

tracking, acquiring and processing the weather satellite data. All processor and display functions must be capable of using transferable, archived data to enhance WETM readiness through realistic satellite data interpretation training. The DMSP system will first send data via directional S-band and with the planned spacecraft modifications, will later add an omni-directional transmitter resulting in a hybrid tracking capability.

b. Maintainability, Availability, and Reliability. Combat air organizations are moving towards a two-level maintenance concept for deployed operations. Communications electronics personnel will perform deployed maintenance responsibilities which will consist largely of simple card and part replacement from a mission support kit (MSX). The STT provisioning process must include enough spares for the MSX to support a 30-day deployment without resupply. Maintenance may establish a communications system support center (CSSC) in or out of theater for more complex maintenance needs. If maintenance does not establish a CSSC, it will send the inoperative parts to a depot or contractor for repair. Weather operators will perform preventive maintenance and "box," component, or peripheral replacement. ("Box," component, or peripheral replacement does not include internal part or card replacement requiring opening a panel.) The time between preventive maintenance inspections must be at least 1,000 hours and operational availability must be at least 98 percent. The STT must have the capability to fault, diagnose, identify, report, and isolate to an assembly, module, and single circuit card assembly 98 percent of all failures without using external test equipment or tools.

c. The STT system must include a modular and container concept to use both air and surface transportation. Both configurations of the STT will consist of small, hardware size, rugged containers requiring no more than a 2-person lift. Containers must have automatic pressure vacuum relief valves. The container design will have front and back panel removal enabling "rack mounted" STT. The container design will allow complete removal of STT components. The B STT system must not exceed 500 pounds (200 pounds is an objective) and must not exceed 120 cubic feet packaged. The E STT should add no more than 1,200 pounds (750 pounds is an objective) to the B STT. These weights include all hardware equipment such as tools antennas, processors, display devices, a generator, cables, spares, expendables, etc. The STT containers will be easily transportable by both tactical vehicles and aircraft. The system's ruggedness must withstand transportation shock and frequent setup and tear down. Two people in nuclear, biological, and chemical protective clothing, including gloves, should take less than 1 hour to setup or tear down the B STT and no more than 2 hours for the E STT. The STT system will operate from both a portable generator or worldwide commercial power. The antenna will operate up to 100 feet from the main equipment, with an option of up to 500 feet.

4. DEPLOYMENT.

a. Whenever weather personnel deploy, they'll use the STT to acquire weather satellite data. Each WETM will take a STT as part of the first-in weather support equipment. The STT operator, in coordination with higher headquarters Staff Weather Officers (SWOs), will determine the specific STT data receipt configuration based on the operational scenario (maneuverability,

threat signature, geographic location, etc). For example, if deployed to a fixed site within the geoatationary satellite footprint, the operator should receive all available data, including WEFAX and DOD and civil polar orbiters, to increase refresh rate and resolution. In a threat aignature area (where the enemy targets dish-type antenna), the WETM may decide to employ only the small omni-directional antenna for receipt of civil APT data and DMSP data (when DMSP omni-directional broadcast becomes available).

b. The component level and above will deploy with the E STT; units at wing level and below will deploy with the B STT or E STT as dictated by mission requirements and weight and space limitations. The AN/UMQ-13(V-2) Meteorological Data Station will later replace the E STT in support of the Joint Task Force (JTF) and collocated components. The replace E STTs will then be ueed at the wing level or lower.

c. Air Force support WETMs will likely load their STT on a 463L pallet along with the rest of their gear (forecasting and observing hardware). As such, small size and modular containers are important. An Army support WETM will likely upload the STT onto their unit vehicle along with the rest of their gear.

5. EMPLOYMENT.

a. The STT may be used by Air Force and Army support WETMs at all echelons, from the Air force Special Operations Detachment, Airlift Control Element, Independent Squadron, or Aviation Brigade, to the Theater Weather Center or Force Level. WETMs will use the STT in conjunction with the Combat Weather System (CWS), Transportable Automated Weather Distribution System (TAWDS), and IMETS. The locations needing STTs will probably have limited initial communications capability. The STT is one element of a 2-element satellite terminal employment plan. The two elements are a sophisticated terminal and a small portable terminal. The sophisticated terminal, an AN/UMQ-13(V-2) Meteorological Data Station, will provide high resolution cloud imagery (polar and geostationary, simultaneous ingest) and a theater weather data base for weather support to command and control centers. The small portable unit, STT, provides for receipt of cloud imagery and a limited weather data base for all dispersed weather units and will connect directly to the CWS. The E STTs at the JTF and component level will provide a "first-in" capability until a transportable AN/UMQ-13(V-2) arrives in-theater (usually within C+30 to C+60 days). The JTF SWO will coordinate repositioning of the E STT with the Air Forces Forces and Army Forces SWOs. The WETMs will use the E STTs as needed and where needed. For Army applications, the STT will be integrated in the IMETS.

b. WETMs will use the STT to receive the following:

(1) Cloud Imagery.

(a) DMSP. This is RDS (1.5 NM resolution) and RTS (0.3 NM resolution) visible and infrared encrypted cloud *imagery.* This is the *only* sure source of weather data over enemy-held territory. Provides a detailed depiction of current weather in the Area of Operations (AO) and upstream weather affecting the AO for the next 12 to 24 hours.

(b) Civil Satellite APT. This is visible and infrared non-encrypted cloud imagery of at least 2.2 NM resolution. Provides additional polar orbiter cloud imagery. Decreases the data gap of current DMSP constellation and has no tracking antenna required as it is omni-directional. Used at times between DMSP passes.

(c) Non-encrypted geostationary civil satellite **WEFAX** products. Provides data refresh capability. If the **AO** is within about 60 degrees latitude and 70 degrees longitude of satellite subpoint, data animation (looping) gives improved temporal analysis of synoptic scale weather systems.

(2) DMSP encrypted mission sensor data.

(a) Special Sensor Microwave Imager (SSM/I) 7-channel microwave imagery. Provides pseudo radar capability with the **85 GHz** channel and identifies separate rainfall bands and areas masked by large cloud masses.

(b) **SSM/I** Environmental Data Records. Provides estimates of windspeed over oceans, rainfall rate, surface temperature, soil moisture, and other parameters. These data are not available from any other weather satellite. It is useful for trafficability of ground forces and as **forecaster** input to electro-optical tactical decision aids **(EOTDAs).**

(c) Atmospheric parameters of temperature, moisture, and winds, derived from Special Sensor Microwave Temperature (SSM/T) and SSM/T-2 data. Provides only sure source of atmospheric profiles from enemy-held territory. Enhances single station forecasting by providing atmospheric profiles. Theee data are useful for various TDA input. NOTE: Analysis products will require initialization fields from either climatology or entered by the operator.

c. The STT must have meteorological, image, and general purpose analysis tools necessary to display and manipulate satellite imagery; i.e., contouring, animation, and overlays.

d. For Air Force support **WETMs,** the STT may be used either as a stand-alone system or an integrated part of other tactical meteorological hardware (e.g. TAWDS, CWS). Army support **WETMs** will use the STT in conjunction with their **IMETS.**

(1) Stand-alone. A WETM may choose to deploy with a minimal weather support capability. Using only the STT, the WETM can provide capable short-range weather support.

(2) TAWDS. In the near term, the STT will be used in conjunction with TAWDS. Imagery and uniform gridded data fields (**UGDFs**) will be forwarded from the STT to the TAWDS. No processing will be done on the TAWDS.

(3) **CWS.**

UGDFsery and

(4) IMETS. The STT antenna, antenna controller, communications security equipment, and global positioning system devices will interface with the IMETS. The IMETS will provide power, the data and image processor, displays, and printers to process and disseminate the STT products. Eventually, the STT antenna control and receiver software will be hosted on the IMETS.

6. OPERATIONAL ENVIRONMENT. The STT will operate continuously, 24 hours per day. The display and associated electronic processing, printing, and storage equipment will operate in a customer-provided tent, shelter, or vehicle. The computer resources must operate at ambient temperatures from -10 C to 50 C. The antenna will operate outside the shelter in the full range of temperature, humidity, and weather conditions such as heavy rain, snow, freezing precipitation, blowing dust and sand, and winds. The antenna must operate at temperatures from -40 C to 60 C. Wind loading for STT antenna systems shall be 30 miles per hour (MPH) (56 MPH is the objective) in sustained winds and 50 MPH (75 MPH is the objective) in wind gusts. The STT does not need to survive a nuclear or conventional attack. However, the system will operate in and near potentially heavy concentrations of electromagnetic interference.

7. THREAT. STT operation has no identified threat since it is not a weapon system used against the enemy. However, the tracking dish antenna could present a visible system signature. The subdued colored omni-directional antenna reduces the visible signature of the system but makes it more susceptible to jamming or interference.

a. SECURITY. Treat DMSP imagery and mission sensor data as unclassified information.

a. Physical. Store and treat DMSP data as Essential Elements of Friendly Information. Events will determine the need for any other required physical security.

b. Operations. When transmitting DMSP data or imagery files to another user, encrypt the transmission and use "for transmission only" to deny unauthorized use.

c. Communications. Use embedded decryption (similar to STU III).

9. STANDARDIZATION, INTEROPERABILITY, AND COMMONALITY. STT data must follow Unit Level Open System Architecture standards to integrate with existing or planned weather processing equipment. The workstation will be the standard workstation used by combat forces.